Neuroscience Intersection

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Neuroscience Intersection

I) Advances in our understanding and utilization of neuroscience will have a dramatic impact on DARPA's mission

A) Sensory, motor, and cognitive processes

B) Bidirectional brain-machine interfaces

C) Biomimetic approaches

D) Autonomous systems

All require collecting neural signals and understanding how the brain interprets them. Need data on large populations and fine dynamics.

Neuroscience Intersection

II) New Technologies: barriers and opportunities

A) Monitoring large ensembles of neurons

- **Better spatial & temporal resolution (non-invasive)**
- **Wireless recording capabilities**
- **Integrating *in vitro* technology with *in vivo* work**
- **Genetic techniques to measure and manipulate**

B) Understanding neural ensemble activity

- **Use of non-linear dynamical systems models**
- **Algorithms for decoding population responses**
- **Biologically realistic models and learning mechanisms**

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II) New Technologies (continued)

C) Implementation in artificial devices

- Hypothesis generation and testing
- Brain-like devices and computational methods
- Engineer autonomous systems

D) Expanding human capabilities to sense and act

III) Education

- Need to nurture collaborative efforts between theoretical and experimental scientists and engineers
- Need to train a cadre of new scientists with combined skills